

What Is Claimed Is:

1. In a direct injection type internal combustion engine in which a fuel is injected directly into a cylinder, in
5 said cylinder a tumble flow of air is formed and a rich air-fuel mixture is gathered and a stratification operation is carried out, said direct injection type internal combustion engine wherein

an opening and closing valve for shutting off an
10 intake air passage for supplying said air into said cylinder and a bypass passage for bypassing said opening and closing valve and having a cross-section smaller than a cross-section of said intake air passage; and

an outlet of said bypass passage is opened near to an
15 intake valve of an outlet portion of said cylinder.

2. A direct injection type internal combustion engine according to claim 1, wherein

an outlet portion of said air said bypass passage is
20 opened near to center of said cylinder in a side of an ignition plug of said intake valve.

3. A direct injection type internal combustion engine according to claim 1 or claim 2, wherein

said opening and closing valve is a rotary valve having three positions comprising a full closing, a middle opening, and a full opening.

- 5 4. A direct injection type internal combustion engine according to claim 1 or claim 2, wherein

said opening and closing valve is a combination of two semi-circular shape valves.

- 10 5. In an internal combustion engine having a partition wall which partitions an intake air passage for introducing air into a cylinder in an upper stage and a lower stage, wherein

said partition wall is constituted of a bimetal, and
15 a valve for closing a lower side passage of said intake air passage during a low temperature time of said engine is provided,

said bimetal partition wall is constituted to deform to a position in which said bimetal partition wall makes
20 narrow an upper side passage.

6. In a direct injection type internal combustion engine in which a fuel is injected directly into a cylinder,

said direct injection type internal combustion engine
25 comprising:

an intake valve for introducing air into a cylinder and provided in an outlet of said cylinder, an electromagnetic solenoid mechanism for controlling an opening and closing said intake valve, a device for forming
5 a tumble flow of said air into said cylinder by gathering a rich air-fuel mixture in a vicinity of an ignition plug, a opening and closing valve for shutting off an intake air passage, and a bypass passage for bypassing said opening and closing valve and having a cross-section smaller than a
10 cross-section of said intake air passage, and an outlet of said air of said bypass passage is opened near to said intake valve.

7. A direct injection type internal combustion engine
15 comprising:

an electromagnetic type variable valve mechanism in which an opening and closing timing of an intake valve and an exhaust valve is enable to control regardless to a rotation number;

20 an opening and closing valve for shutting off an intake air passage for introducing air into a cylinder, cylinder; and

a communication passage for communicating said intake air passage of adjacent cylinders;

thereby an intake stroke time of one cylinder,
compression air of said adjacent cylinders is flown through
one of said communication passages.

5 8. A direct injection type internal combustion engine
according to claim 7, wherein
during a starting time a specific cylinder is burned.

9. A control method of an intake air passage of an
10 internal combustion engine, wherein
during said starting time, supplying said air into a
cylinder through an intake valve from an intake air passage
having a small cross-section; and
generating a tumble flow into said cylinder; and
15 after a warming-up of said engine, increasing said
cross-section area of said intake air passage than a cross-
section area of said starting time.

10. An air supply method of an internal combustion
20 engine, wherein
during a starting time, supplying said air into a
cylinder through an intake valve from a first intake air
passage having a small cross-section area;
generating a tumble flow into said cylinder;
25 after a warming-up of said engine, supplying said air
into said cylinder through an intake valve from a main

intake air passage which is divided into an upper state and a lower stage; and

in a stratification operation region, generating said tumble flow into said cylinder by closing a lower side
5 passage of said main intake air passage.

11. A direct injection type internal combustion engine comprising:

a fuel injector for injecting directly a fuel into a
10 combustion chamber;

an ignition coil for igniting an air-fuel mixture of said combustion chamber; and

an air-fuel mixture induction device for forming an air-fuel mixture region which enable to easily spark at a
15 vicinity of said ignition plug during a starting of said internal combustion engine.

12. A direct injection type internal combustion engine according to claim 11, wherein

20 said air-fuel mixture induction device comprises a tumble air supply device for forming a tumble air flow in said combustion chamber.

13. A direct injection type internal combustion engine
25 according to claim 11, wherein

said air-fuel mixture induction device comprises a narrow conduit passage provided adjacently side by side to a main intake air passage and a change-over valve provided in a branch portion between said conduit passage and said
5 main intake air passage.

14. A direct injection type internal combustion engine, wherein

an air and fuel mixture induction device for inducing
10 a mixture of an air and a fuel in a surrounding portion of an ignition plug in a cylinder by operating immediately after an operation of a starting switch of said internal combustion engine is provided; and

said air and fuel mixture induction device functions
15 to a cylinder which enters firstly to an intake stroke after at least an operation of said starting switch; and

said air and fuel mixture is induced to said surrounding portion of said ignition plug in said cylinder.

20 15. A direct injection type internal combustion engine, wherein

a bypass passage for supplying an air into a cylinder by bypassing a main intake passage is provided; and

when a rotation number of said internal combustion
25 engine is 150-200 rpm, said bypass passage has a passage

diameter in which a pressure in said cylinder during said intake stroke is -100 mmHg degree (88 Pka degree).